## Claims

We claim:

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1.      A memory medium comprising program instructions for implementing an integrated interface for a plurality of instruments for signal analysis, wherein the memory medium is in a computer system comprising a display, wherein the program instructions are executable to implement:

10      a) receiving user input specifying an operation, wherein the operation implements at least a portion of a signal analysis function;

b) performing the operation in response to the specifying, wherein said performing utilizes at least one of the plurality of instruments to perform the operation;

c) displaying an icon on the display in response to said specifying, wherein the

15      icon comprises a graphical representation of the operation, and wherein the icon is displayed upon the specifying; and

d) storing information specifying the operation;

repeating a) – d) a plurality of times to specify the signal analysis function;

wherein the operations in the signal analysis function comprise at least one of 1)

20      generating signals displayed in a graph, and 2) modifying one or more signals displayed in the graph;

wherein, after each respective operation is specified, the operation is performed substantially continuously during said repeating;

wherein the signal analysis function utilizes at least a first plurality of the plurality

25      of instruments, wherein the plurality of instruments comprises two or more virtual instruments (VIs);

wherein after said repeating a plurality of icons are displayed on the display representing a plurality of operations, wherein the plurality of icons are arranged to visually indicate the signal analysis function; and

wherein said repeating produces a set of stored information representing the plurality of operations in the signal analysis function.

2.      The memory medium of claim 1,

wherein the program instructions execute under a signal analysis function development environment; and

wherein the set of stored information specifying the plurality of operations is executable in the signal analysis function development environment to perform the signal analysis function.

3.      The memory medium of claim 2, wherein the program instructions are further executable to implement:

executing the set of stored information, wherein said executing the set of stored information comprises executing the plurality of operations to perform the signal analysis function.

4.      The memory medium of claim 1, wherein the operations in the signal analysis function further comprise at least one of 3) producing an output based on one or more signals displayed in the graph; and 4) exporting a signal.

5.      The memory medium of claim 1, wherein the program instructions are further executable to implement:

specifying a relationship between a first icon and a second icon, thereby specifying a relationship between a first operation and a second operation;

wherein said specifying the relationship between the first icon and the second icon comprises specifying that data produced by the first operation is used by the second operation.

6.      The memory medium of claim 1,

wherein, during said repeating, receiving user input to one or more of the icons for configuring one or more of the plurality of operations, wherein said receiving user input for configuring one or more of the plurality of operations does not include receiving user input specifying programming language code to configure the operations; and

5          wherein, for each operation, said configuring the operation affects functionality of the operation.


7.      The memory medium of claim 6, wherein the program instructions are further executable to implement:

10          for each operation to be configured,

displaying a graphical panel including one or more graphical user interface elements for setting properties of the operation; and

receiving user input to the graphical panel to set one or more properties of the operation.

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8.      The memory medium of claim 1, wherein the program instructions are further executable to implement:

receiving user input specifying removal of a first operation from the plurality of operations;

20          wherein, in response to the user input specifying removal, the program instructions are further executable to implement:

discontinuing performance of the first operation from the plurality of operations in response to said specifying removal; and

discontinuing display of the first icon in response to said specifying

25    removal;

removing information associated with the first operation from the set of stored information; and

modifying one or more signals displayed in the graph, as needed.

9.     The memory medium of claim 1,

wherein the program instructions execute under a signal analysis function development environment; and

wherein the program instructions are further executable to implement:

generating a program implementing the plurality of operations, wherein the program is generated based on the set of stored information, wherein the program is executable outside of the signal analysis function development environment.


10.     The memory medium of claim 1,

wherein each icon of the plurality of icons corresponds to one or more nodes in a graphical programming development environment.


11.     The memory medium of claim 1, wherein the program instructions are further executable to implement:

generating a graphical program based on the set of stored information, wherein the graphical program comprises a plurality of interconnected nodes which visually indicate the signal analysis function, and wherein the graphical program is executable to perform the signal analysis function.


12.     The memory medium of claim 11, wherein the program instructions are further executable to implement:

receiving user input specifying removal of a first operation from the plurality of operations;

removing a first operation from the plurality of operations in response to said specifying removal; and

removing the one or more nodes corresponding to the first operation from the graphical program in response to said removing the first operation.


13.     The memory medium of claim 1,

wherein the memory medium stores a plurality of virtual instruments, wherein each of the virtual instruments is executable on a computer system to implement an instrument function; and

wherein the plurality of operations utilize two or more different ones of the plurality of virtual instruments.

14. The memory medium of claim 13, wherein the plurality of virtual instruments comprise a signal generator VI, an oscilloscope VI, and a multimeter VI.

15. The memory medium of claim 14, wherein at least a portion of the plurality of virtual instruments operate in conjunction with respective hardware boards.

16. The memory medium of claim 1,

wherein the program instructions are further executable to implement:

displaying a graphical user interface that provides access to a set of operations; and

wherein said receiving user input specifying the plurality of operations comprises receiving the user input to the graphical user interface specifying the plurality of operations, wherein the plurality of operations are selected from the set of operations.

17. The memory medium of claim 16,

wherein said receiving user input to the graphical user interface specifying the plurality of operations does not include receiving user input specifying programming language code to implement the plurality of operations.

18. The memory medium of claim 1, wherein in receiving user input specifying an operation, the program instructions are executable to implement:

receiving user input to the graph indicating one or more signals displayed in the graph;

providing one or more operation options in response to said receiving user input to the graph; and

receiving user input selecting an operation option from the provided one or more operation options, wherein the selected operation option indicates an operation to be performed on the indicated one or more signals.

19.    The memory medium of claim 18, wherein the one or more operation options comprise only operation options appropriate for the selected one or more signals.

20.    The memory medium of claim 1, wherein in receiving user input specifying an operation, the program instructions are executable to implement:

receiving user input to the graph indicating one or more signals displayed in the graph; and

receiving user input associating the one or more signals with a first icon of the plurality of icons displayed on the display;

wherein after said associating, the operation represented by the first icon is performed on the one or more signals.

21.    The memory medium of claim 1, wherein the plurality of instruments comprises at least one standalone hardware device.

22.    The memory medium of claim 1, wherein the information comprises configuration information for the plurality of instruments to perform the signal analysis function.

23.    The memory medium of claim 1, wherein the integrated interface comprises a Graphical User Interface (GUI) operable to be displayed on a display device.

24.     The memory medium of claim 23, wherein the GUI comprises a soft front panel, wherein the soft front panel comprises an interface for a respective hardware board, and wherein the soft front panel emulates a front panel for the hardware board.

5       25.     The memory medium of claim 24, wherein said receiving user input specifying an operation comprises:

receiving user input indicating a pre-defined graphical program, wherein the pre-defined graphical program implements the first operation.

10      26.     The memory medium of claim 25, wherein the program instructions are further executable to implement:

associating the pre-defined graphical program with a control in the GUI, wherein the first operation is invocable via user input to the control.

15      27.     The memory medium of claim 26, wherein said associating is performed in response to user input indicating an association between the pre-defined graphical program and the control.

28.     The memory medium of claim 26, wherein the program instructions are 20 further executable to implement:

associating one or more of the operations of the signal analysis function with a respective control in the GUI, wherein the one or more operations are invocable via user input to the respective control.

25      29.     The memory medium of claim 28, wherein said receiving user input specifying an operation comprises:

receiving user input to the respective control for the operation, thereby invoking the one or more operations.

30.    The memory medium of claim 25, wherein the program instructions are further executable to implement:

displaying the pre-defined graphical program in the GUI.

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31.    A signal analysis system, comprising:

a processor;

a memory medium coupled to the processor;

a display coupled to the memory medium and the processor; and

10    one or more hardware devices coupled to the memory medium and the processor;

wherein the memory medium stores a plurality of virtual instruments, wherein each of the virtual instruments is executable on a computer system to implement an instrument function, and wherein the plurality of virtual instruments and the one or more hardware devices comprise a plurality of instruments;

15    wherein the memory medium further stores program instructions executable by the processor to:

a) receive user input specifying an operation, wherein the operation implements at least a portion of a signal analysis function;

b) perform the operation in response to the specifying, wherein said performing

20    utilizes at least one of the plurality of instruments to perform the operation;

c) display an icon on the display in response to said specifying, wherein the icon comprises a graphical representation of the operation, and wherein the icon is displayed upon the specifying; and

d) store information specifying the operation;

25    repeat a) – d) a plurality of times to specify the signal analysis function;

wherein the operations in the signal analysis function comprise at least one of 1) generating signals displayed in a graph, and 2) modifying one or more signals displayed in the graph;

wherein, after each respective operation is specified, the operation is continuously performed during said repeating;

wherein the signal analysis function utilizes at least a first plurality of the plurality of instruments;

wherein after said repeating a plurality of icons are displayed on the display representing a plurality of operations, wherein the plurality of icons are arranged to visually indicate the signal analysis function; and

wherein said repeating produces a set of stored information representing the plurality of operations in the signal analysis function.

32. The signal analysis system of claim 31,

wherein the program instructions execute under a signal analysis function development environment; and

wherein the set of stored information specifying the plurality of operations is executable in the signal analysis function development environment to perform the signal analysis function.

33. The signal analysis system of claim 31, wherein the program instructions are further executable to:

generate a graphical program based on the set of stored information, wherein the graphical program comprises a plurality of interconnected nodes which visually indicate the signal analysis function, and wherein the graphical program is executable to perform the signal analysis function.

34. A computer-implemented method for analyzing signals, the method comprising:

a) receiving user input specifying an operation, wherein the operation implements at least a portion of a signal analysis function;

b) performing the operation in response to the specifying, wherein said performing utilizes at least one of the plurality of instruments to perform the operation;

c) displaying an icon on the display in response to said specifying, wherein the icon comprises a graphical representation of the operation, and wherein the icon is displayed upon the specifying; and

d) storing information specifying the operation;

repeating a) – d) a plurality of times to specify the signal analysis function;

wherein the operations in the signal analysis function comprise at least one of 1) generating signals displayed in a graph, and 2) modifying one or more signals displayed in the graph;

wherein, after each respective operation is specified, the operation is performed substantially continuously during said repeating;

wherein the signal analysis function utilizes at least a first plurality of the plurality of instruments, wherein the plurality of instruments comprises two or more virtual instruments (VIs);

wherein after said repeating a plurality of icons are displayed on the display representing a plurality of operations, wherein the plurality of icons are arranged to visually indicate the signal analysis function; and

wherein said repeating produces a set of stored information representing the plurality of operations in the signal analysis function.

35. The method of claim 34,

wherein the method executes under a signal analysis function development environment; and

wherein the set of stored information specifying the plurality of operations is executable in the signal analysis function development environment to perform the signal analysis function.

36. The method of claim 34, wherein the method further comprises:

generating a graphical program based on the set of stored information, wherein the graphical program comprises a plurality of interconnected nodes which visually indicate the signal analysis function, and wherein the graphical program is executable to perform the signal analysis function outside the signal analysis function development

5    environment.


37.    A memory medium which stores program instructions implementing an integrated interface for a plurality of instruments for signal analysis, wherein the program

10    instructions are executable to perform:

receiving user input invoking each of a plurality of operations, wherein the plurality of operations implement a signal analysis function;

wherein for each respective instance of the user input invoking a respective operation, the medium is configured to perform:

15            performing the respective operation in response to the invoking, wherein the operation utilizes at least one of the plurality of instruments to perform the signal analysis function;

displaying an icon in response to said invoking, wherein the icon corresponds to the respective operation and comprises a graphical representation of the

20    respective operation, and wherein the icon is displayed upon the respective invoking; and

storing information specifying the operation;

displaying a graph comprising one or more signals based on one or more of the plurality of operations;

wherein the plurality of operations utilize at least a first plurality of the plurality

25    of instruments, wherein the plurality of instruments comprises two or more virtual instruments.

38.     A memory medium which stores program instructions implementing an integrated interface for a plurality of instruments for signal analysis, wherein the program instructions are executable to perform:

receiving user input invoking each of a plurality of operations, wherein the plurality of operations implement a signal analysis function;

performing each of the plurality of operations in response to respective ones of said invoking, wherein each operation is performed upon each said invoking, wherein the plurality of operations utilize at least a subset of the plurality of instruments to perform the signal analysis function, and wherein the plurality of instruments comprises two or more virtual instruments;

displaying each of a plurality of icons in response to said invoking, wherein each icon corresponds to a respective one of the plurality of operations, and wherein each icon is displayed upon each said invoking;

storing information specifying the plurality of operations; and

displaying results of one or more of the plurality of operations, wherein said results include one or more tables of data, and/or one or more graphs each comprising one or more signal plots.

39.     A memory medium comprising program instructions for implementing an interface for an instrument for signal analysis, wherein the memory medium is in a computer system comprising a display, wherein the program instructions are executable to implement:

displaying a soft front panel, wherein the soft front panel comprises an interface for a respective hardware device, wherein the soft front panel emulates a front panel for the hardware device, and wherein the soft front panel comprises a first plurality of controls for invoking respective signal operations, wherein the first plurality of controls substantially corresponds to a respective plurality of physical controls for the hardware device;

receiving user input to one of the first plurality of controls specifying an operation, wherein the operation implements at least a portion of a signal analysis function;

storing information specifying the operation;

5 performing the operation, thereby generating resultant data, wherein said performing utilizes the instrument to perform the operation; and

displaying the resultant data in the soft front panel.

40. The memory medium of claim 39, wherein said displaying the soft front 10 panel comprises:

displaying a Graphical User Interface (GUI), wherein the GUI comprises the soft front panel;

wherein the GUI further comprises a second plurality of controls, wherein each of the second plurality of controls is operable to be associated with a respective one or more 15 operations, and wherein the respective one or more operations are invocable via the associated one of the second plurality of controls to perform at least a subset of the signal analysis function.

41. The memory medium of claim 40, wherein the program instructions are 20 further executable to implement:

receiving user input indicating a pre-defined graphical program, wherein the pre-defined graphical program implements a first operation.

42. The memory medium of claim 41, wherein the program instructions are 25 further executable to implement:

associating the pre-defined graphical program with a first control of the second plurality of controls in the GUI, wherein the first operation is invocable via user input to the first control.

43.     The memory medium of claim 42, wherein said associating is performed in response to user input indicating an association between the pre-defined graphical program and the first control.

5     44.     The memory medium of claim 43, wherein the program instructions are further executable to implement:

displaying the pre-defined graphical program in the GUI.

45.     The memory medium of claim 42, wherein the program instructions are further executable to implement:

10     further executable to implement:

associating the one or more operations of the signal analysis function with a first respective control of the second plurality of controls, wherein the one or more operations are invocable via user input to the first respective control.

15     46.     The memory medium of claim 39, wherein the hardware device comprises a hardware board.